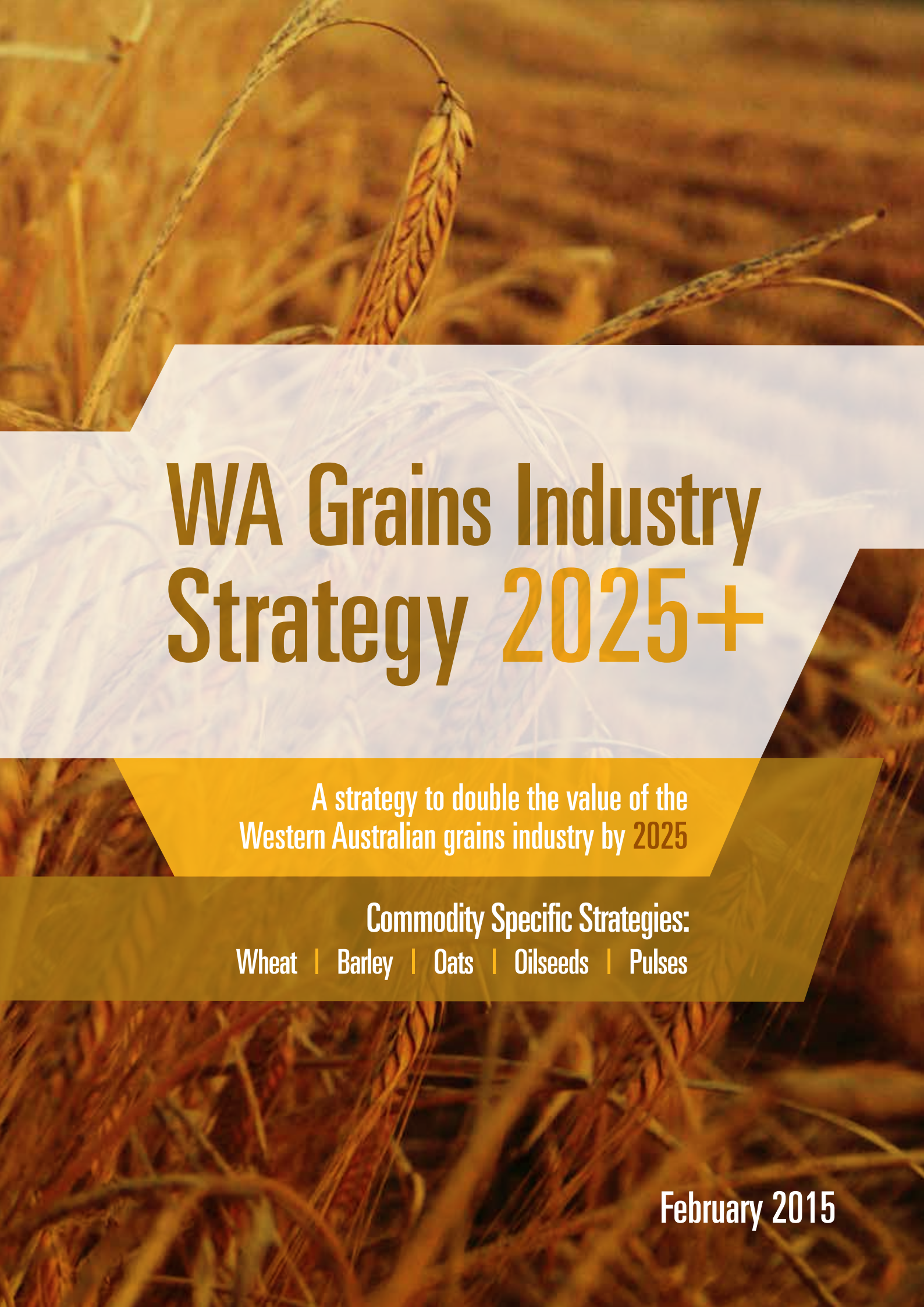

WA Grains Industry Strategy 2025+

A strategy to double the value of the Western Australian grains industry by 2025

Commodity Specific Strategies:

Wheat | Barley | Oats | Oilseeds | Pulses

February 2015

Introduction

The Western Australian grains industry was challenged to develop a strategy to focus on actions to double the value of the grains industry over the next decade to 2025[1]. The development of this strategy was undertaken on behalf of, and with wide consultation across, the WA grains industry to focus on the key actions and guide investments and projects that would lead to a substantial increase in the value of the WA grains industry. It has been compiled by the Grain Industry Association of WA Inc (GIWA) and funded by the Department of Agriculture and Food, WA (DAFWA).

Having been developed over the past nine months, the *WA Grains Industry Strategy 2025+* was released to the WA grains industry in February 2015. In addition to the eight industry strategies developed for the grains industry, which are available in a separate document, specific action strategies have been identified for wheat, barley, oats, oilseeds and pulses and these are the subject of this report.

Action on the commodity specific strategies covered in this report will be addressed through respective GIWA commodity councils in cooperation, and with the assistance of, other industry organisations and individual businesses.

Please direct all correspondence to:
Email: info@giwa.org.au

or mail

WA Grains Industry Strategy 2025+
GIWA
PO Box 1081
Bentley DC WA 6983

---

[1]The Department of Food and Agriculture Western Australia (DAFWA) is leading 'Agrifood 2025+' – an initiative initiative in which Agriculture and Food Minister Ken Baston and DAFWA aim to double the real-term value of sales from Western Australia's agrifood sector between 2013 and 2025. Closely linked to the State Government's Seizing the Opportunity initiative, 'Agrifood 2025+' supports the state government's goal to broaden the base of the state's economy. Industry and government agree that the agrifood sector has the potential to contribute more to the state's economy, with its farming business potential yet to be fully realised due to limited demand. An increasingly prosperous Asia, coupled with rapid worldwide population growth, is now starting to provide the buying power needed to make that development viable.

Contents

Wheat

The following represent strategic actions specifically targeted at the WA wheat industry.

Access to high value markets

1. Maintain integrity and increase opportunities for export

> **Research market opportunities for Australian wheat in developing markets**

There is an opportunity to expand the number of wheat markets WA wheat could enter if analysis of blends using WA wheat with local or other international origin grain is undertaken to prove its utility in these markets, and pro-active engagement of end users is undertaken to support new uses. In doing this work, there is a need to be cognisant and sensitive to the commercial relationships already in place with Australian grain exporters and their customers. The focus needs to be on markets not currently accessed by Australian exporters.

> **Review of requirements in high value markets**

WA wheat is currently marketed as four main grades – Australian Hard (AH), Australian Premium White (APW), Australian Noodle Wheat (ANW) and Australian Standard White No 1 (ASW1). While receival standards are consistent for each grade, the value proposition of these grades in other potential markets needs to be analysed. With large changes in consumption patterns in China, the Middle East and South East Asia, there are opportunities to broaden the value these grades offer. There is a need to undertake an analysis of value received to the industry through having WA wheat segregated into the four main grades in each market and explore opportunities for increased value of these and other grades through changes to receival standards, e.g. grading of small grains, chaff and weeds from loads prior to delivery to increase purity of delivered product.

> **Find a higher-value use for lower-grade noodle wheat and/or identify markets that can expand consumer demand for Australian udon noodles**

Solely producing ANW poses a risk to growers in many production years, with out-of-specification grain downgraded to General Purpose (GP). If off-grade ANW can be used in alternative end uses which capture even small price premiums, then grower confidence in noodle production will be sustained and lead to more stable supply.

> **Investigate niche markets**

Niche markets are present in some countries, such as steamed buns, and WA wheat often has utility for these end uses. Low protein/low gluten wheats may have an increasing role in starch and bioplastics production. Wheat straw has been an underutilised resource, but new technology allows this to be effectively converted to biofuels and biochemical.

> **Innovation to capture value in the (protein) supply chain**

Processing of grain largely uses globally available technologies, which may or may not be patented. New technologies developed in Australia that complement Australian wheat genetics may be patentable and allow for protection of value-adding processes.

Focussed Research & Development (R&D)

2. A whole of industry strategy for late-maturity alpha-amylase (LMA)

LMA involves the production of α-amylase during the middle-to-late stages of grain development and ripening, and may result in lowering falling numbers to below receival standards and customer specifications. LMA is often triggered by a change in temperature (a 'cold shock') during the late stages of grain fill. All wheat varieties in Australia are required to pass LMA testing before they are allowed to be classified into a milling grade in the Australian system. LMA is listed by Australian wheat breeders as one of the single most rate-limiting steps in the development of new varieties.

Work required:

- Further development of a reliable screening methodology.
- Phenotypying capacity.
- A commercial screening service.
- A review of the industry risk of LMA in the field and its relationship to the LMA pass/fail threshold set by Wheat Quality Australia for the classification of varieties.
- A revision of the industry process to determine LMA benchmarks.
- Development of a draft management plan for the possible inclusion of 'significant value' LMA expressing varieties.

3. Analyse of the trade-off between yield and breeding for quality traits

Productivity gains are slowing in WA in line with the global trends, and this is impacting grower profitability. As crop performance is made up of the interaction between genetics, environment and management, the opportunities to lift yields have to be understood in the context of each of the components and how they interact.

A major consideration is the trade-off between yield and crop quality. Identifying if strong yield improvement is biologically and economically sound will require a strategic analysis of the Genotype x Environment x Management (GxExM) components and interactions, and some comprehensive modelling of the potential to achieve more yield and profit, but not at the cost of lowered quality.

From a breeding perspective; if we add new 'requirements' for high value markets, there is a need to ensure market value for achieving the requirements compensates for the slower pace of yield improvement. For every additional trait requiring selection there is a slower rate of progress in achieving higher yield. Increasing yield by 10 percent over a 10 year period is the equivalent value of incorporating an additional quality trait valued at $20-$25 per tonne with no net yield improvement. Hence there is a need for both market intelligence on requirements, and economic assessment of the value of pursuing breeding traits into new varieties, before classification systems are changed.

Key questions that need to be asked in this space include those around removal of sub-soil constraints; what role root diseases and nematodes are having on water supply to crops; are nutrients becoming more limiting as larger crops are harvested; how to forecast the high production years for improved yield; and how close we are to the genetic potential in wheat for the climate.

4. Analyse the business case for a general grade wheat

The corollary of analysing high value markets, and the need for different grades to cater for them, is to look at the demand for a non-segregated single general grade wheat stack.

A general grade wheat has potential advantages in reducing costs of receival and segregation; allowing plant breeders to focus on yield and stress characteristics; standardisation of all wheat shipments from WA; and greater flexibility for growers to rationalise deliveries.

China's demand for grain to feed animals is expected to continue expanding for another two decades, with increasing demand in other parts of Asia and Africa. As wheat can replace up to 50% of corn for energy in livestock diets, there is scope to consider development of high-yielding low-protein feed wheats for WA. These feed wheats can also be easily used in bio-ethanol and bio-gas production systems if feed wheat price was to fall dramatically. By avoiding the need to breed for quality, rates of genetic gain for yield may be faster than for bread or noodle wheats.

Growing conditions in a large part of the WA grainbelt could be better suited to producing a high yielding utility wheat to compete with US soft wheat into Asian markets. Significant investigation of the potential for this strategy needs to be undertaken first – do the short term costs outweigh the long term benefits, or vice versa?

Barley

The following represent strategic actions specifically targeted at the WA barley industry.

Access to high value markets

1. Ensure receival standards closely match market demand

Examine the case for lifting the grain protein window for malt barley to increase the volume of higher protein malting barley grain available to specific customers. This should be first investigated via a cost-benefit analysis to ensure any changes will have broad benefits for the WA industry.

Investigate reducing the number of barley segregations. There needs to be a balance between number of segregations based on customer demand, agronomic characteristics and financial value of the segregation. Feedback from the marketplace is buyers of malt barley would prefer a maximum of two malt varieties at each delivery site and feedback from international customers is they would prefer two to three varieties for the whole of Australia.

It is important the protein standards for malting barley should not be higher than those required by the market. The current 'cliff face' protein standard cut-off for malt and feed grade is effecting many growers on the border line. This is largely driven by the limited demand for high-quality malting barley mainly destined for the domestic market. It is estimated only 25% of barley sown in WA targets high-value malt markets. Many growers have opted towards growing Hindmarsh, a high-yielding food grade variety which is in demand for malting in price-sensitive international markets, and other barley varieties that give high yields for feed grain use.

A viable feedlot industry would create a greater demand for feed barley. This may require the development of optimal quality parameters for feed barley rather than just viewing feed as anything that doesn't make malt grade. It would also provide a good fit for acid tolerant varieties.

Efficient and competitive supply chain

2. More effective accreditation process for malting varieties

There is a need for a more effective accreditation system which is export focused, transparent and incorporates consultation, but is accelerated compared to the current process. Barley Australia has been investigating the use of the Australian Export Grains Innovation Centre (AEGIC) Pilot Malting and Brewing facility in WA to try and improve and shorten the turnaround time in accrediting new varieties.

The GIWA Barley Council supports the efficient and timely market development of new varieties. For a new malting variety to be considered for commercial production in WA, GIWA recommends the new variety has the following attributes:

- The variety is suited to the WA production environment.
- Agronomic properties of the variety are superior to existing varieties.
- Malting and brewing properties are superior to existing varieties ensuring the new variety will be marketable into the main Australian malt barley market.
- New varieties should be only received on a restricted basis (ie. one to three recieval points), in WA until markets are confirmed for the traits and the appropriate agronomy packages are available.

Focussed R&D

3. Perceived grain defects

The blue aleurone issue needs to be reviewed with regards to its impact on export demand, and managing the risk of rejection and/or discounting. Are we holding back genetic gain by restricting the use of germplasm with any trace of susceptibility to discolouration of the aleurone layer? This may have implications for breeding programs in the long term, but it could be solved by revaluating the markets for which blue aleurone is a problem and offer them access to a segregated source, rather than let this factor affect all barley exported from Australia.

4. Value of malting barley quality traits

There is a market for cheaper, high-yielding varieties which meet lower malt quality characteristics, particularly in Asia.

It is therefore important that there is rigorous economic analysis of each malt barley quality trait to determine what the market is prepared to pay for, focusing particularly on Asian markets.

A second related area of research would be the economic analysis of the opportunity to breed specific non-malt barley varieties for Asian markets. This could lead to increased demand for barley production and open up a mid-range price point below premium malting barley and feed barley.

Access to skilled people

5. Research capacity

There is a lack of industry pathways to ensure future technical competencies for the barley industry.

There is a need to consolidate pre-breeding and agronomic research capacities, particularly between WA and South Australia, to gain efficiencies in focusing on improving the profitability of barley production.

Oats

The following represent strategic actions specifically targeted at the WA oat industry.

Access to high value markets

1. Evaluate the market access opportunity or potential value of a voluntary on-farm production certification program for oat grain and/or hay

Oat exporting and value-adding occurs at a range of scales in WA and this may provide the opportunity to more closely link WA voluntary industry certification to international oat processors and consumers.

A scoping study is recommended to identify opportunities (including value propositions and industry appetite) to enhance the position of the industry in the next five-10 years through the adoption of a voluntary on-farm certification scheme.

2. What end use health features in oats could build market demand and/or differentiation for Australian oats in the future?

There is recognised potential for growth in the demand for oat-based food products in Asia and elsewhere, while demand for feed oats is limited.

The emphasis on end uses in the health segment of the human food market for oat grain can create future opportunities for the WA oat industry to increase demand and differentiation in international markets. Current health claims for oats are based on the well-established association between soluble fibre and reduced risk of coronary heart disease. Oats also contain healthy plant-based oils and fatty acids as well as phytochemicals which are associated with protection from chronic disease. Understanding the health features that would provide market demand and differentiation for Australian oats should aid industry competitiveness and returns in the future.

3. Australian Oats National Joint Industry Plan to meet future growth in export market demands. WA/SA/VIC/NSW – Grain and Oaten Hay

WA grain oats are exported to Mexico, China, Japan, Hong Kong, Singapore, Malaysia, Philippines, South Africa and the Middle East. WA hay oats are exported to key markets in north-east Asia with emerging markets in China and the Middle East likely to fuel demand in the future. Oat grain consumption in China is growing by 15% per annum with about 20% of Chinese consumers estimated to now enjoy oats regularly. Market opportunities also exist in India and Sri Lanka. Seasonal droughts, such as during 2010, impact grain and hay production and present challenges to building markets for WA oats. To meet the challenges of future competition from other oat exporters, including Canada, Europe and South Africa, can the oat exporting sectors on the east and west coast of Australia align to better meet future demand for oats in international markets? There may be an opportunity to form an Australian Oat Council, similar to Pulse Australia or the Australian Oilseeds Federation.

Focussed R&D

4. Competitive oat milling and hay varieties adapted to medium-to-low rainfall areas

Oat production in Australia has been focussed in medium-high rainfall environments. In alignment with this, the National Oat Breeding Program undertakes most of the oat breeding and selection in WA at field sites in medium and high rainfall environments.

There is an opportunity to broaden the reliable areas of oat production into medium-to-low rainfall areas, through the incorporation of germplasm with improved tolerance of drought and heat to:

- Add diversity to the Medium to Low rainfall production systems.
- Add stability to production and quality through improved tolerance to environmental stress.
- Increase and provide a more stable production from year to year to meet emerging export demand.

5. Investigate existing and new herbicides for oat production

Weed management options for oats are limited compared to other cereals. Oats are negatively impacted by the increase in herbicide resistant weeds. There is no effective control of ryegrass post-emergence in oats in many paddocks and ryegrass is becoming increasingly tolerant to group B (ALS inhibitors) herbicides.

There is a need to determine the efficacy of established and new herbicides for oat registration and to investigate the integration of herbicides and oat weed management practices including the effects on hay yield, residues and quality (e.g. diflufenican spotting) in addition to grain yields.

The aim would be to achieve:

- Added flexibility and productivity in oat production systems, including competitiveness in lower production environments.
- More cost effective weed management, sustainable farming systems.
- Maintain market access with chemical stewardship/industry best practice.

6. Develop reliable agronomic packages for medium and low rainfall areas for oat grain and hay production.

Agronomically, oats are most suited to the medium-high rainfall areas of the WA grainbelt. Oats have greater tolerance to frost compared to other grain crops in WA. Accordingly, there is interest in broadening production of oats to include medium-low rainfall areas. It is possible that existing varieties can be grown in drier areas if agronomic packages are modified.

The benefits of this strategy would be to:

- Improve economic returns and risk reduction in oat production in medium to lower rainfall areas.
- Provide an additional break crop to improve the diversity of the medium-to-low rainfall production systems.
- Add increased stability to oat production and quality through improved management.
- Provide a diversification frost risk management option in these target areas.

Oilseeds

The following represent strategic actions specifically targeted at the WA oilseeds industry.

Access to high value markets

1. Safeguard existing markets and develop new markets

The European Union (EU) currently imports WA canola seed for use in biodiesel production, in order to comply with the EU Renewable Energy Directive (EU RED). While not a requirement, the EU preference is for non-Genetically Modified (GM) canola; which WA has been able to supply as a result of effective segregation, and in doing so, realising a significant market premium. Exports to the EU from Australia have been between 500,000 and 1.5 million tonnes per year over the last two years. Access to the EU canola markets for use in biodiesel has required the adoption of EU approved certification schemes to meet sustainability requirements of EU RED.

Australia needs to determine greenhouse gas (GHG) emission data for the production of canola in order to continue to meet EU RED requirements when new conditions come into effect from January, 2017. Establishing GHG values, and having them accepted by the EU, is a 'must do' in order to ensure this market remains open for WA canola.

China is the second most important market for canola exports from WA. Exports to China have similarly been very significant over the last two years. China does not have the virulent strain of blackleg which is present in Australia and Canada, and consequently imports of Australian (and Canadian) canola are subject to strict quarantine conditions. These conditions are temporary and China is urging Australia (and Canada) to agree to an import protocol which will enable trade to continue. Consequently, finalising a trade protocol with China is essential if WA is to secure this market into the future.

Given the high dependence on Europe and China, and the inherent risks with these markets, there is a need to develop other high value markets to allow for greater resilience. Japan and Korea, while already existing markets, offer opportunities for growth and development, while other new market opportunities need to be investigated.

2. Develop export and domestic markets for processed canola products

Currently, WA processed canola products are, in the main, sold to the domestic Australian market. The recent Free Trade Agreement and resultant changes in tariffs may help to facilitate export markets to Korea and Japan. The Korea-Australia Free Trade Agreement (KAFTA) came into effect at the end of 2014. Tariffs to be eliminated are: 10% on canola seed and 8% on crude oil tariff eliminated over 10 years and the 10% tariff on refined oil to be eliminated over five years. Under the Japan Australia Economic Partnership Agreement the tariffs on crude oil (10.9 Y/kg) and refined oil (13.2 Y/kg) will be eliminated over 10 years.

Limited domestic markets for canola meal also limit the level of processing of canola in WA. The demand for high-quality animal feed is growing in Asia, driven by the growing demand for meat protein. While soybean meal is the major competitor in these markets, primarily for monogastrics, canola meal has a unique position as a favoured protein source for dairy herds.

A concerted effort in building both the domestic and international market for canola meal and oil in international markets is a priority if the industry is to realise the value creation opportunity that comes from greater oilseed processing in WA.

The potential for establishing a combined grains processing facility in WA has been identified, and would aim to build industry value. The concept is for a large canola crushing plant in combination with a stockfeed pelleting plant. The economies of scale from combining multiple grain processing operations at one site would further enhance the profitability of establishing a world-scale canola, animal feed and potentially a flour mill, to process grain before export.

A feasibility study needs to be undertaken to assess this opportunity.

Efficient and competitive supply chain

3. Maintaining market choice for GM or non-GM canola

In WA, there is a moratorium on the commercial cultivation of GM crops. This moratorium is underpinned by an order issued under the *GM Crops Free Areas* Act 2003 which prohibits the commercial planting of GM crops in WA. An exemption to this prohibition order permits the current commercial planting of GM canola in WA. The Honourable Minister Baston, Minister for Agriculture and Food; Fisheries, is considering the repeal the *GM Crops Free Areas* Act. Repeal of the *GM Crops Free Areas* Act would mean WA growers could plant any GM crop that the Australian Gene Technology Regulator has approved for commercial release in WA.

To enable WA farmers to continue to access GM technology if they so choose, and remain competitive on the world market, it is important the industry provides the necessary support to ensure ongoing 'freedom to operate' for growers. Effective segregation of non-GM canola provides a sound 'proof point' to WA legislators that GM and non-GM canola can co-exist in the supply chain.

WA has experienced the fastest adoption of GM technology of all the canola growing States in Australia, such that by 2014, it is estimated that more than 20% of the canola area was sown to GM canola. While the GM technology has been a benefit for many growers, segments of the market are requiring non-GM canola.

While the industry has demonstrated they can segregate non-GM canola successfully, supply chain protocols supporting a non-GM segregation that meets required specifications need to be maintained and supported if WA is to maintain trade flexibility by being able to offer both non-GM and GM canola to exporters.

Underpinning successful segregation is the market choice principle; ensuring that the market needs drive the supply chain, in this case through a non-GM segregation. It would be beneficial to demonstrate the on-going success of the market choice principle through an effective reporting system, such as a report card. This could be similar to the national residue survey, where the responsibility of meeting market requirements is taken on by the whole industry, and not just the responsibility of individual exporters.

There is also a need to change the terminology in the segregation specifications – from adventitious presence (AP) to low level presence (LLP) to bring WA in line with international terminology.

The social acceptance of the use of GM technology in WA farming is also important. Public concerns are about the safety and/or ethics of GM farming, and while the safety is beyond reproach, the industry needs to recognise the values or ethics based concerns of consumers on this matter.

Focussed R&D

4. Speciality canola

Specialty High Oleic/Low Linolenic (HOLL) canola is above 65% oleic acid content and below 3.5% linolenic acid content; compared with 60% oleic and 10% linolenic acid content in commodity canola.

Specialty canola has been produced in WA for some years, in a closed-loop system, with grain producers involved receiving a premium of $50-95 per tonne, essentially covering any yield loss from newly developed varieties. Production is currently limited to a single receival site close to the processing plant, in Pinjarra. There is strong domestic demand for the oil, but limited uptake by farmers. A Roundup Ready HOLL variety is likely to be released during 2016, which could increase its popularity and open the opportunity for export sales.

The industry needs to continue to support HOLL and encourage grower adoption and expansion, as these innovations serve to 'grow the pie' (for example, taking share from imported palm oil) rather than cannibalising traditional canola.

5. New classification system for differential oil content, segregated by variety

There are canola varieties that do not meet the HOLL criteria for fatty acid content, but are of higher quality than general commodity canola and are of extra value to the market. Both genetics and environment effect the production of HOLL canola. The source for this higher value canola may be from specific varieties delivered to specific receival sites. Initial information has been produced by the Australian Canola Quality project supporting this proposition. A similar principle may also apply to other desirable fatty acid profiles. The continuation of the oil quality project should be supported.

6. Use of established GM pathway for novel canola products

There is an established pathway to producing GM canola. Industry can make further use of this pathway for other GM technologies for the production of food, pharmaceuticals or industrial products. The CSIRO has already developed a GM canola which can produce long-chain omega-3 fatty acids, typically found in fish oil, by transferring genes from micro algae. The CSIRO is now collaborating with Nufarm and the Grains Research and Development Corporation (GRDC) to obtain regulatory approval and to establish the product in Australia. The target is to have seeds commercially available by 2018. This is a closed-loop market. It is likely to be a large market as demand for marine omega 3 fatty acids are increasing, but there are limited sources. While production is not currently targeted in WA, this could present a significant value-adding processing stream for the WA canola market.

The CSIRO is also working on the crop bio-factories initiative. GM safflower can produce fatty acids and oils required by the chemicals industry, as potential replacements for petrochemicals in the manufacture of industrial products. Again, while production is not currently targeted in WA, this could represent a strong value-adding processing stream.

7. Varieties better suited to different environments (i.e. low rainfall, acid soils and high aluminium content)

Canola yields are more variable than wheat yields in the low-rainfall environment. This has a major effect on the proportion of canola in the cropping program, in different rainfall zones across the WA grainbelt. The development of suitable varieties with stable yields could facilitate an increase of canola in the cropping program in the low-rainfall areas.

Improved low-rainfall canola varieties are likely to be open pollinated, because of reduced breeding costs. However, it is more difficult to get return on investment for open-pollinated varieties which may limit the rate of improvement. There are some End Point Royalty (EPR) systems in place. A compulsory EPR program across all canola varieties would support further investment and development in the open pollinated canola types.

Much of the cropping region soils are naturally acidic and yield is effected in many areas. Although WA has a widespread liming program, ameliorating soil acidity is an ongoing issue. A pre-breeding program to incorporate tolerance to acidity would be valuable to the industry.

AOF and GIWA will work with the WA industry in continuing to explore this opportunity.

8. Disease research

Blackleg, Sclerotinia, White Leaf Spot, Downy Mildew and Beet Western Yellow Virus (BWYV) still represent major issues for canola production in WA. Current average yield losses from blackleg are estimated to be 25%. In addition, yield losses due to Sclerotinia are estimated at 4%. To date, Sclerotinia has largely been confined to the warmer northern agricultural regions in WA's grainbelt however conducive conditions during 2013 saw widespread incidences of Sclerotinia across most areas, with average yield losses around 7%. Testing during 2014 has shown it to be widespread in the southern regions and fungicide use has increased.

GIWA will continue to advocate on behalf of the industry to ensure ongoing research funding in disease research for canola is appropriately targeted.

Pulses

The following represent strategic actions specifically targeted at the WA pulse industry.

Access to high value markets

1. Food market development for lupins

Research is needed to define the value of Australian Sweet Lupin (ASL) functionality for potential high value markets as a direct food product. This should include Australian Albus lupin, to help broaden the supply base for supply to markets. Research is also needed to define the health benefits of consuming lupins as a regular part of the diet. This level of R&D may only need to be conducted to a level that enables clear differentiation of lupins from other pulse grains and enables technical information to underpin the marketing of lupins as a food product.

2. Create market pull for lupins in international markets

Develop market intelligence for lupin food markets to understand the drivers of demand in each market. Markets such as China and India need to conduct their own research to demonstrate the human food value of lupins. The idea is that internal demand will be stronger if they recognise the health value themselves. Other countries of interest include Indonesia, the Gulf States, USA and European countries. This may include conducting in-market clinical research to support evidence-based marketing of the health benefits of lupins, and then making the market aware of the health benefits of lupins as part of a sustainable evidence-based market strategy.

3. Support development of a premium feed lupin and provide industry support for aquaculture

High protein lupin meal could be a sought-after vegetable protein for the aquaculture industry both domestically and internationally. Much R&D work has been done by Brett Glencross (CSIRO) and market development is being undertaken by Coorow Seeds.

Functionality research is needed to show the value of ASL. Previous work showed l.luteus lupin was best positioned with higher kernel protein for aquaculture, principally for premium salmon and prawn fisheries.

Efficient and competitive supply chain

4. Storage and handling facilities for pulses

A significant roadblock for increased pulse production in WA, principally chickpea and field pea, is the lack of local receival storage sites with adequate soft- handling equipment.

The current market and likely on-going conditions dictate on-farm storage for considerable time to draw the most value from the market. All niche market pulse products are exported in containers. Even with a substantial lift in production tonnage, this is likely to be the norm for the bulk of WA's pulse production.

There is a great risk of reduced pulse grain quality without the provision of soft-handling equipment. Additionally, container handling facilities at regional ports may improve the efficiency of pulse grain exports.

Focussed R&D

5. Lupin variety breeding

Lupin production occurs primarily in the medium-to-high rainfall environments in the northern half of WA and the development of new lupin varieties tends to be adapted best to this region.

Breeding of lupins should focus on yield improvement, protein enhancement and disease resistance, as well as adaptation to the various climates and soil types of southern Australia. Increased protein content with reduced alkaloid levels will be required for the premium feed industry.

6. Enhanced weed management options for pulses

The current herbicide options for weed control in pulses are about 15 years old. For grass management, resistance has effectively removed almost all post emergent herbicides as viable options. Current weed management using herbicides is focussed on increasing rates to maintain adequate efficacy. R&D focussed on finding new chemistry along with improving integrated weed management strategies is needed to maintain the viability of pulses in the rotation, quite apart from increasing the area of adoption.

Abbreviations

(In alphabetical order)

AEGIC	Australian Export Grains Innovation Centre
AH	Australian Hard
ANW	Australian Noodle Wheat
APW	Australian Premium White
ASL	Australian Sweet Lupin
BWYV	Beet Western Yellow Virus
DAFWA	Department of Agriculture and Food, Western Australia
EPR	End Point Royalty
EU	European Union
EU RED	European Union Renewable Energy Directive
GHG	Greenhouse gas
GIWA	Grain Industry Association of Western Australia Inc
GM	Genetically Modified
GP	General Purpose
GxExM	Genotype x Environment x Management
GRDC	Grains Research and Development Corporation
HOLL	High Oleic/Low Linolenic
ISCC	International Sustainability and Carbon Certification
KAFTA	Korea-Australia Free Trade Agreement
LMA	Late-maturity alpha-amylase / Late-maturity α-amylase
MRL	Maximum Residue Limit
mt	Million metric tonnes
PCR	Polymerase Chain Reaction test
R&D	Research and development
WA	Western Australia

GIWA
Grain Industry Association of Western Australia

www.giwa.org.au